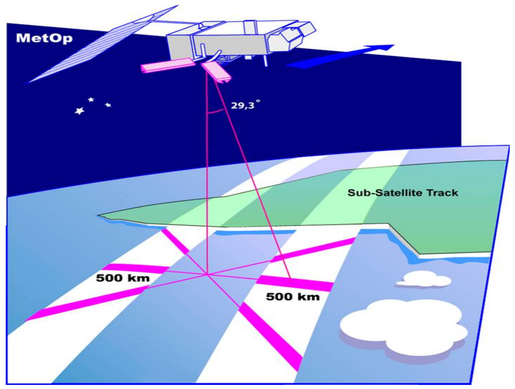
# Combined scatterometer and ground radar observations of convective storms

Georgios Priftis[1], Timothy J. Lang[2], Themis Chronis[3]

[1]Department of Atmospheric Science, University of Alabama in Huntsville; [2]NASA Marshall Space Flight Center, Huntsville, Alabama;
[3]Department of Earth System Science, University of Alabama in Huntsville

## 1. Introduction




**Why use the ASCAT instrument?**

ASCAT is a real aperture radar, operating at 5.255 GHz (C-band), capable of addressing high winds (20–60 m/s) and the partial contamination of rain. It is onboard the MetOp series satellites, MetOp-A and MetOp-B.

The two-satellite constellation retrieves 10m vector winds, approximately 45 minutes apart (for the case examined in this study), in consecutive overpasses. Therefore, it offers a unique capability to study the evolution of high-impact weather events.

12.5-km coastal enhanced data are examined.

**What value is added by investigating the characteristics of high-impact events by using scatterometers?**

After the dual-pol upgrade to WSR-88 radars (2011-2013), new proxies are available for studying weather phenomena. This study will leverage the synergy of these data.

To further investigate the performance of the scatterometer, data from buoys will be retrieved where they are available. The difference among the height of the buoy measurement (2m) and the ASCAT retrieval (10m) is adequate for comparison.

Key Issues to Explore:
1. Utilize wind retrievals to understand the evolution of surface features
2. Interactions between surface wind features and high-impact maritime weather events

Contact Info: Georgios Priftis, gp0014@uah.edu
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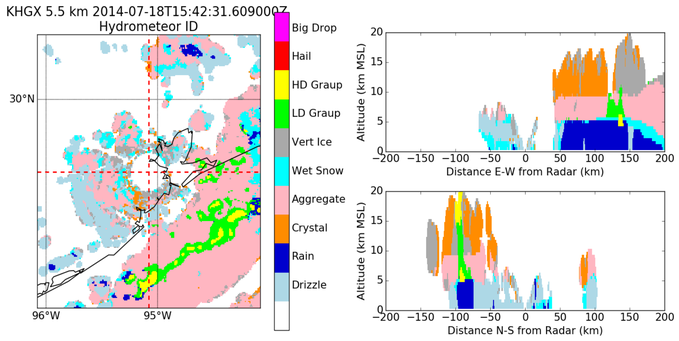
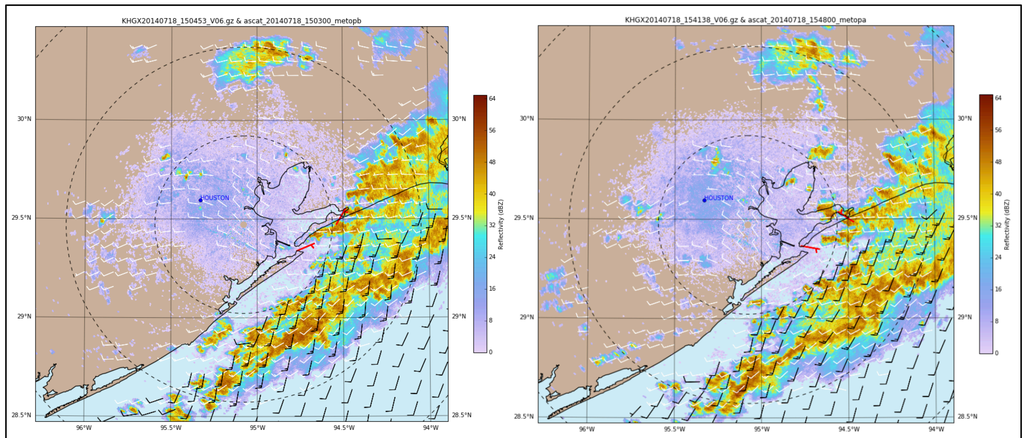
## 2. Case study (Gulf of Mexico)

Here, we present the results of a case in the coastal region of Houston, on July 18th 2014. Heavy precipitation rates were observed, as measured by the KHGX radar. The storm's lifetime allowed it to be captured by both scatterometers (a, b).

- ASCAT captured the heavy precipitation event, denoted by the increase in the wind speed, but failed to identify the change in the wind direction.
- Radar winds stronger than buoy measurements, indicating winds strengthening with height above surface. Radar indicates wind shift along convective line.
- Linear interpolation with respect to the radar was used to generate the time series of the wind speed.

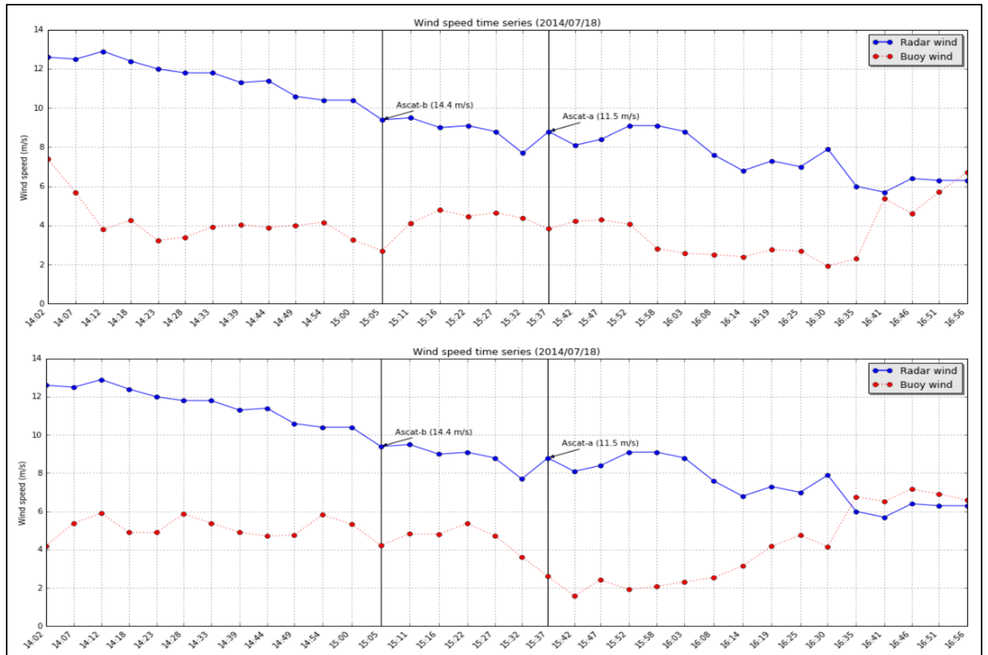



**Black barbs indicate wind retrievals from the scatterometer, white barbs from the KHGX radar and red barbs from the buoy measurements, at the corresponding time. ASCAT-b overpass (left figure) is at 15:03 and ASCAT-a (right figure) at 15:48.**




Divergence and vorticity calculated for each overpass**. The divergence and vorticity for ASCAT-a,b are smoothed by averaging over a 50 km by 50 km domain**. The data for the analysis are wind vectors optimized for coastal ocean by PODAAC/JPL (12.5 km x 12.5 km).




**Time series (in CDT) of the wind measurements. Arrows indicate the time of the ASCAT overpasses only. The upper and bottom plots corresponds to the right and left buoys on the map (red barbs), respectively.**

## 3. Discussion

- ASCAT detects surface features (e.g., divergence) associated with the evolution of the mesoscale system during the consecutive overpasses. However, features could be influenced by rain impacts. Direction change along front not detected by ASCAT.
- The dual-pol radar can provide additional insights into the characteristics of these systems and the associated features observed by the scatterometers.

References:
Kilpatrick, T.J. and S.-P. Xie (2015), ASCAT observations of downdrafts from mesoscale convective systems. Geophys. Res. Lett., 42(6), 1951–1958.